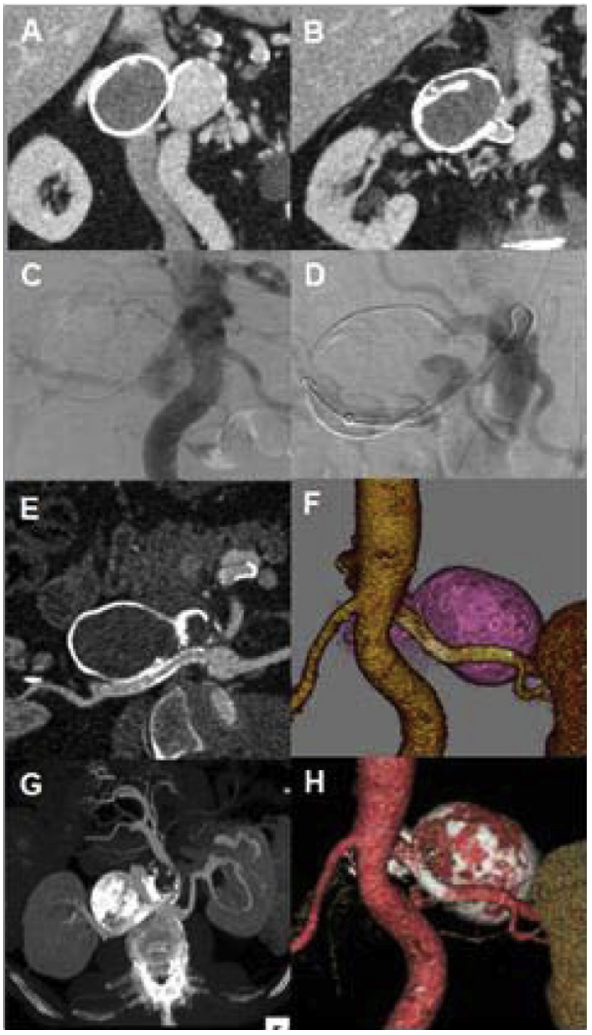

Fig. Preoperative computed tomographic angiography demonstrating two large proximal right renal artery aneurysms **(A-B)**. Angiography following placement of initial covered stent in proximal-mid right renal artery **(C)**. Given persistent filling of the more proximal aneurysm, a brachial approach was used to place a second, more proximal covered stent **(D)**. Postoperative imaging demonstrating successful aneurysm exclusion and absence of endoleak at two-week **(E-F)**, one-year **(G)**, and two-year **(H)** follow-up periods.

Author Disclosures: V. Chandra: None; **B. W. Ullery:** None; **J. T. Lee:** None.

Cardiac Stress Testing During Workup for Abdominal Aortic Aneurysm Repair Does Not Improve Patient Outcomes

Benjamin S. Brooke, MD, PhD,[1] Yingying Zhang, MS,[2] Tom H. Greene, PhD,[2] Yue Zhang, PhD,[2] Angela Presson, PhD,[2] Larry W. Kraiss, MD[1]. [1]Division of Vascular Surgery; [2]Division of Epidemiology, University of Utah School of Medicine, Salt Lake City, Utah

Objective: Cardiac stress testing (CST) is commonly used to help determine whether patients with abdominal aortic aneurysms (AAAs) are candidates for open (oAAA) vs endovascular repair (EVAR), although it is unknown whether CST achieves its goal of optimizing patient selection and postoperative outcomes. This study examined whether use of CST improves adverse cardiac events and survival after AAA repair.

Methods: We identified 3635 patients in the Vascular Quality Initiative (VQI) database (2010-2012) with an AAA ≥5.0 cm who were candidates for oAAA or EVAR. The VSG Cardiac Risk Index was used to stratify patient risk. We then applied generalized estimating equations with inverse probability weighting to adjust for patient factors and hospital level CST utilization to evaluate the effect of CST on 30-day major adverse cardiac events and mortality after AAA repair. Analyses were restricted to hospitals with 20% to 80% CST utilization to facilitate adjustment of the utilization rate.

Results: CST was used in 1627 patients (45%) during AAA workup, including 451 of 794 patients (57%) selected for oAAA and 1176 of 2841 patients (41%) selected for EVAR. After inverse probability weighting, the use of CST was not associated with the proportion of patients receiving oAAA vs EVAR (odds ratio, 1.00; 95% confidence interval, 0.77-1.32). Compared with patients without CST during the AAA workup, adjusted analyses revealed that CST utilization was not associated with improved outcomes after AAA repair (Table). Among patients receiving CST, an abnormal CST was not significantly associated with selection of oAAA vs EVAR or with postoperative outcomes after adjustment for the VSG cardiac risk score.

Conclusions: Utilization of CST during workup for AAA repair is not associated with improved postoperative outcomes. Our results suggest that CST adds no value beyond known clinical risk factors when selecting patients for oAAA vs EVAR or in predicting postoperative cardiac events.

Table. Effect of preoperative cardiac stress testing (*CST*) on outcomes after open or endovascular abdominal aortic aneurysm repair

Outcomes (CST vs no CST)	*OR (95% CI)*	P
30-day		
Myocardial infarction	1.16 (0.71-1.92)	.55
MACE	1.15 (0.89-1.49)	.28
Mortality	0.70 (0.44-1.10)	.12
MACE or mortality	1.03 (0.82-1.29)	.82
1-year mortality	0.99 (0.69-1.41)	.95

CI, Confidence interval; *MACE,* major adverse cardiac event; *OR,* odds ratio.

Author Disclosures: B. S. Brooke: None; **Y. Zhang:** None; **T. H. Greene:** None; **Y. Zhang:** None; **A. Presson:** None; **L. W. Kraiss:** None.

Deterministic Effects Following FEVAR Are Less Prevalent Than Expected

Melissa L. Kirkwood, MD, Jeffery Guild, PhD, Gary Arbique, PhD, Carlos Timaran, MD, Jon A. Anderson, PhD, Gregory Modrall, MD, R. James Valentine, MD. Surgery, Division of Vascular and Endovascular Surgery, University of Texas Southwestern Medical Center, Dallas, Tex

Objective: Fenestrated endovascular aortic stent grafts (FEVAR) are high radiation dose cases, yet no skin injuries were found retrospectively in our 61 cases with a mean peak skin dose (PSD) of 6.8 Gy. We hypothesize that skin injury is under-reported. This study examined the deterministic effects in FEVARs after procedural changes implemented to detect skin injury.

Methods: All procedures with a radiation dose >5 Gy reference air kerma (RAK; NCRP threshold for substantial radiation dose level [SRDL]) were included during a 6-month period. Patients were questioned about skin erythema, epilation, and necrosis, with a physical examination of the back completed daily until discharge and then at 2 weeks, 4 weeks, and 3 months. PSD distributions were calculated using custom software using input data from fluoroscopic machine logs and were validated against gafchromic film measurements using linear regression. Dose was summed for the subset of patients with multiple procedures within 6 months of the SRDL event, consistent with TJC recommendations.

Results: Twenty-two cases reached a RAK of 5 Gy. The average RAK was 7.6 ± 1.9 Gy (range, 5.1-11.4 Gy), and the mean PSD was 5.9 ± 1.5 Gy (range, 4.0-8.9 Gy). Fifty-five percent had had multiple endovascular procedures within 6 months of the SRDL event. The mean RAK for this subset was 9.6 ± 2.4 Gy (range, 5.5-13.4 Gy), and mean PSD was 6.2 ± 2.0 Gy (range, 4.5-11.0 Gy). Gafchromic film measurements were not different from PSD estimations ($P < .001$), with a constant of proportionality of 0.99 ± 0.02. One patient died before the first postoperative visit. No radiation skin injuries were found. Putative risk factors for skin injury were evaluated: Smoking (32%), diabetes (14%), cytotoxic drugs (9%), and fair skin type (91%). No other risk factors were present (hyperthyroidism, collagen vascular disorders).

Conclusions: Radiation doses in this study exceeded published thresholds for cutaneous injury, yet no radiation skin injuries were observed. This suggests that deterministic effects are likely less frequent than